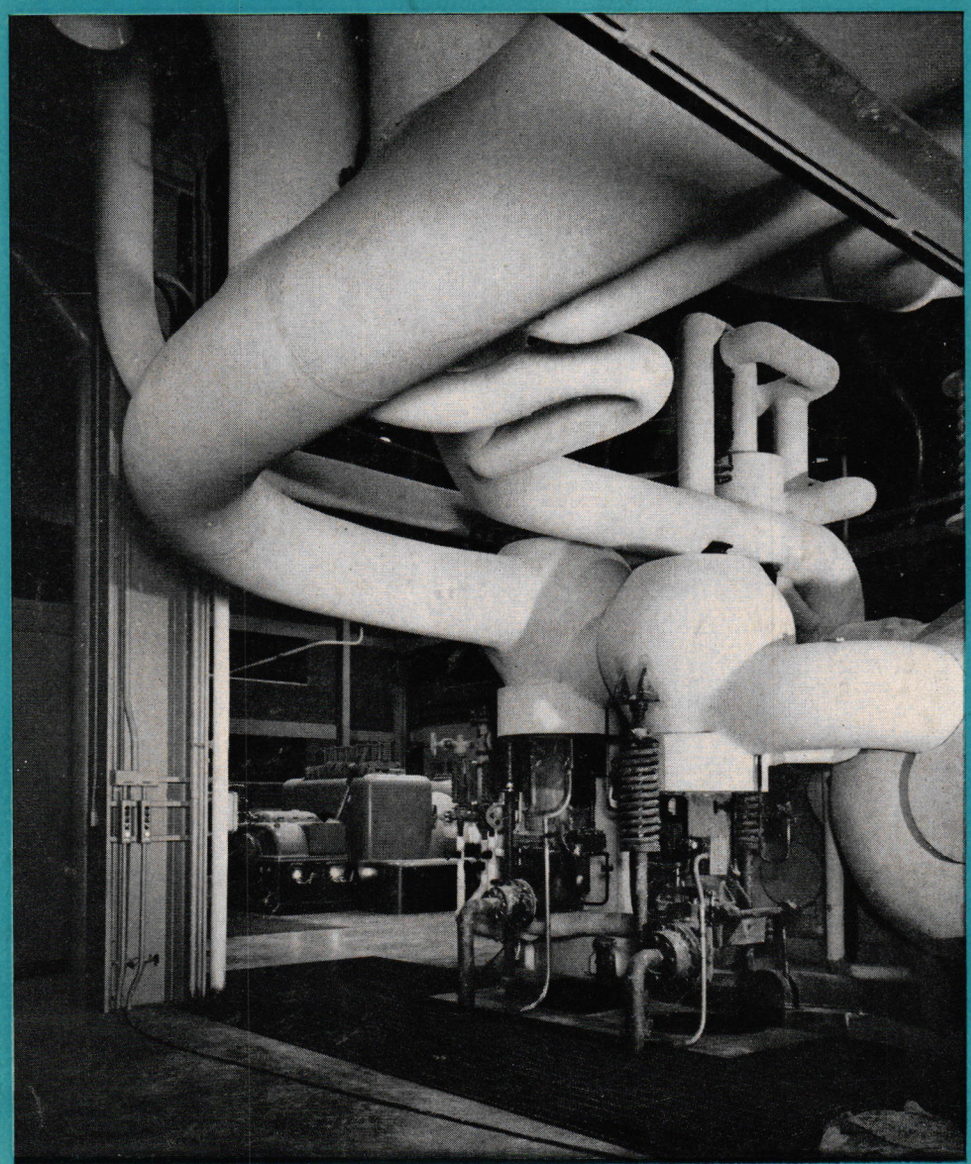
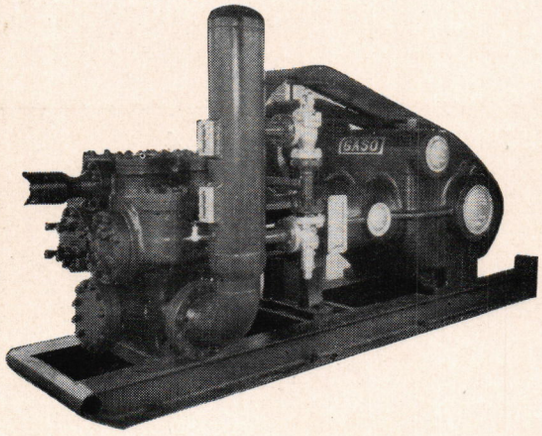
# the Mechelecty

VOL. 10 MARCH 1951 NO. 4



THE SCHOOL OF ENGINEERING
GEORGE WASHINGTON UNIVERSITY

*Another page for* **YOUR BEARING NOTEBOOK**



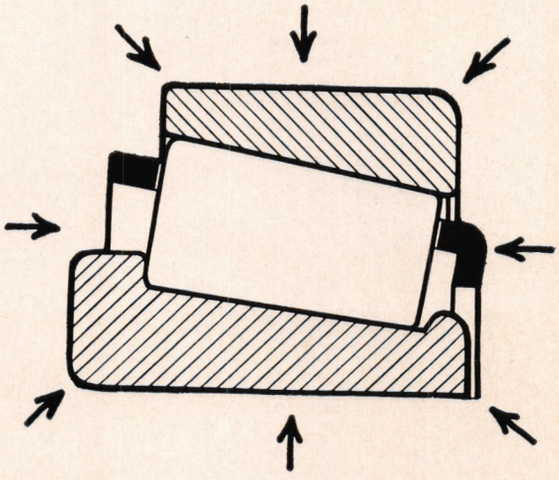
## How to keep a pump in its prime

Piston power pumps, used to pump oil through long pipelines, often have to operate 24 hours a day. To prevent breakdowns and minimize maintenance under this tough service, designers mount pump crankshafts on Timken® tapered roller bearings. Timken bearings take the heavy radial, thrust and combination loads. They prevent wear, insure trouble-free operation.

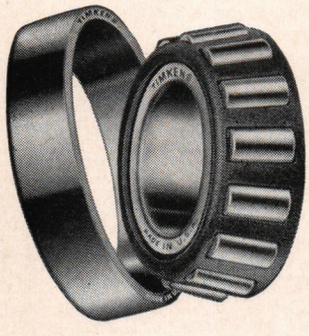
---

## Why TIMKEN® bearings prevent wear on related parts

Due to their tapered design and line contact between rollers and races, Timken bearings carry the heaviest loads from any direction. They keep the crankshaft in proper alignment so that gears mesh more smoothly—last longer. And they eliminate crankshaft wear.



---



**TIMKEN**
TRADE-MARK REG. U. S. PAT. OFF.
**TAPERED ROLLER BEARINGS**

## Free bearing information:

Some of the engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'll be glad to help. For additional information about Timken bearings and how engineers use them, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

---

**NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬭ AND THRUST →⬭← LOADS OR ANY COMBINATION ✳**

# A gun barrel made of glass . . .

**This scientist** is putting together the barrel of an "electron gun." When completed, it will be capable of developing cancer-killing rays at twice the power of those given off by all the medical radium in the world.

The barrel of the gun, part of a new super-voltage X-ray machine used in cancer research and treatment, is a tube formed by stacking precision-made rings of one of Corning's special electrical glasses.

Two million volts drive electrons through the tube, much as a bullet is driven through a gun barrel. As these electrons are suddenly stopped by a water-cooled block of gold at the end of the barrel, two-million-volt X-rays are generated. This X-ray beam is powerful enough to reach diseased areas four inches inside the body and it can be directed with great accuracy on the spot the doctor wants to bombard.

High Voltage Engineering Corporation, manufacturers of this generator, at first had difficulty finding a high-voltage electrical insulating material for the gun barrel, a material that would stand electron bombardment hour after hour without breaking down. The answer to their problem was a glass selected from the many developed by Corning to meet exacting electrical specifications.

Providing glass for medical research is not new to Corning. Since the early days of X-rays, glass by Corning has played a vital part in the development of X-ray apparatus —transmitting glasses for tubes and absorbing glasses for shields. And Pyrex brand laboratory and pharmaceutical glassware has served medical science since World War I.

Throughout industry, *Corning means research in glass*—research that has contributed in countless ways to better products and processes, and through them, to better living for us all.

**That's why we suggest**—when you're out of college and concerned with improving products or processes—that you consider glass, a material of practically limitless uses. And should you want to know more about Corning electrical glasses, or the hundreds of other glasses Corning makes, we hope you'll write us before your planning reaches the blueprint stage. Corning Glass Works, Corning, New York.

**CORNING**
**means research in glass**

☆ In 15 years of aviation pioneering a remarkable series of "Firsts" have been credited to Bell Aircraft Corporation. Bell engineers—with imagination and initiative—have been *writing* the aviation books. Every "First" has bulwarked Bell's position as a leader in the industry.

**FIRST** twin-engine escort fighter, multi-place, and mounting a 37 mm cannon in flexible gun turrets (Airacuda).

**FIRST** American fighter designed around its armament, firing cannon thru propellor hub, with tricycle landing gear (Airacobra).

**FIRST** commercial helicopter, with automatic stabilizing control.

**FIRST** supersonic airplane (X-1).

**FIRST** in many defense projects now restricted.

**OTHER FIRSTS:** Bell's pioneering spirit also developed—

**FIRST** satisfactory .50 caliber machine gun shock dampener which became standard for both Army and Navy.

**FIRST** modern all-wood military fighter (XF-77).

**FIRST** jet-propelled fighter in the U. S. (Airacomet).

**FIRST** commercial helicopter with 200 hp. engine and skid landing gear.

In the column at the right of this page we have listed many of the positions now available to qualified engineers, physicists, and applied mathematicians. Whether your interest lies with guided missiles, helicopters or supersonic aircraft, it is time to seriously consider YOUR future. Bell Aircraft's accomplishments in research, development and design provide the opportunity for permanent employment in all of our long-range programs.

We believe in the future of the aviation industry. Do you believe in YOUR future? Where will you be in your chosen career 10, 15, 20 years from now? Inquire NOW to find out how your abilities and training may mean a full and satisfying life for you with the leader in aircraft engineering. Salary, insurance and retirement benefits are most liberal. Secure application from your college placement office or write: Manager, ENGINEERING PERSONNEL.

**BELL** *Aircraft* CORPORATION
P. O. BOX 1, BUFFALO 5, NEW YORK

## CAREER OPPORTUNITIES

***Check Yourself:***

- ☐ Electrical Designer
- ☐ Thermodynamicist
- ☐ Aerodynamicist
- ☐ Electronics Engineer
- ☐ Servomechanisms Engineer
- ☐ Electro-mechanical Engineer
- ☐ Telemetering Engineer
- ☐ Structural Analysis Engineer
- ☐ Instrumentation Engineer
- ☐ Rocket Motor Development Engineer
- ☐ Structural Designer
- ☐ Rocket Motor Test Engineer
- ☐ Missile Coordinator
- ☐ Flight Test Engineer
- ☐ Transmission Design Engineer
- ☐ Project Engineer
- ☐ Microwave Engineer
- ☐ Flutter Engineer
- ☐ Static Test Engineer
- ☐ Vibrations Engineer
- ☐ Weight Control Engineer
- ☐ Specifications Engineer
- ☐ Radar Engineer
- ☐ Structures Research Engineer
- ☐ Communications Engineer
- ☐ Dynamics Engineer
- ☐ Ultra-high Frequency Engineer
- ☐ Missile Test Engineer
- ☐ Electrical Systems Engineer
- ☐ Mechanical Systems Engineer

# The MECHELECIV

**Volume 10** **March 1951** **Number 4**

Published at the George Washington University by direction of the Engineers' Council. Published six times during the school year in October, November, December, March, April and May. Application for entry as second class matter is pending. Address communications to Mechelecіv Magazine, Student Union Annex, George Washington University, Washington 6, D. C.

Subscription price: One Dollar



***Editor-in-Chief***
BILL SEABROOKE

***Associate Editor***
ED MCGANDY

***Editorial Staff***
TOM MUTCHLER
JACK SCHOFIELD
DINO KARAYIANIS
ED HUGHES
LARRY LAUBSCHER
ANNETTE TRUITT
EMMETT DEAVIES
JOHN PARASKEVAS

***Business Manager***
HAROLD GERSTEN

***Circulation Manager***
DICK CALDWELL

***Business Staff***
HARRY KRIEMELMEYER
RAY PETERITAS
ED YOUNGER
CLINT WARD
BOB CURTIS
JOHN FEARNOW
TOM FLANAGAN
KEITH HORD

***Faculty Advisor***
PROFESSOR NORMAN B. AMES

***Alumni Advisory Board***
WILLIAM F. ROESER
FRANK H. BRONOUGH
GEORGE F. TITRINGTON
LAWRENCE K. HYDE
J. HAROLD LINK

***National Advertising Representatives***
Littell-Murray-Barnhill, Inc.
101 Park Avenue, New York 17, N. Y.


## TABLE OF CONTENTS


Editorial ..... page 6

The Ladder to the Top ..... 7

Mercury Steam Generation ..... 9

Societies and Fraternities ..... 14

Alumnews ..... 16

News and Views ..... 17


### *About our Cover*

*The pipes shown are heavily protected and insulated in order to transmit mercury steam at high temperatures and pressures in the Schiller Station at the Public Service Company of New Hampshire, at Portsmouth, New Hampshire.* *See page 9.*

## ENGINEERING SCHOOL CALENDAR
### March 1951

March 5—Monday—Engineers' Council Meets, Conference Room, Student Union Annex

March 7—Wednesday—ASME, IRE and AIEE meet in Hall of Government, 8:15 p.m.

March 7—Wednesday—ASCE Banquet at Naval Medical Center, Bethesda

March 14—Wednesday—Sigma Tau Meets, C-200

March 17—Saturday—Theta Tau Dinner-Dance, Burlington Hotel, 7:00 p.m.

March 21—Wednesday—Theta Tau Meets, Room D-201, 8:15 p.m.

March 28—Wednesday—Sigma Tau Meets, C-200

# . . . . the forgotten men

Although a great many people think that the engineers are the forgotten men who are only called to mind when there is a great need for them, most of us know that when we selected engineering as a profession we had decided a number of major factors about our career. We had decided that we would labor unceasingly in our own small assignment, whatever it might be, to help construct a better world for people to live in.

Civil engineers will go on throughout their lifetimes struggling to build the best possible highway, to construct a dam to bring water to areas which could not formerly sustain life, to bridge a bay or a river which has obstructed the course of modern progress since rivers were dropped as a means of transportation, or to build an office or factory building which will make it possible to manufacture and distribute new products in a waiting world.

Electrical engineers will spend their whole lives struggling to bring electric power to more people in the world, and to make it possible for those who have it to utilize it in more ways so they can live a fuller life.

Radio engineers will concentrate the fifty years after graduation on a daily struggle to make a few tubes and a piece of wire the means to a fuller life for a hundred million people, while mechanical engineers will spend the same fifty years devising new ways to keep the temperature in an enclosed space constant, or to find a kind of gear that will make it possible to stretch out more comfortably in a car.

In the fifty years after graduation, the engineer has planned to spend every day struggling against delay, political conniving of enemies, weather, and a thousand other obstacles. And when the fifty years is done, there will be no more than a handful of people who even know the name of the man who spent that fifty years working for their benefit. It sounds tough, but that is the thing which the engineer has selected as a way of life.

Many times, when a freshman fails a subject, or even a junior, you will hear over the coffee cups in the Student Union that the failure was caused by that Professor Gimmick, who is a heel and a rotten so-and-so. Besides, the whole school system is badly in need of revamping, and anyway there shouldn't be any such arbitrary measure as the grading of one man's efforts against another's. Well, anyway, it won't last long because Uncle Sam will get us in another few days, or weeks, and we can loaf for two years. It looks like our life is just a lost cause, and let's not go to class anymore.

It seems incredible that a man who believes it worthwhile to struggle for fifty years for the benefit of others cannot conceive of the idea of preparing himself to surmount an obstacle which will take two years, or at the most four. Assuming that the undergraduate is drafted, or recalled to active duty, his assignment will be to perform some small duty in the struggle between two ideologies which can no longer exist on the earth together. But without his service, there will be no need for him to have an engineering degree, because there will be no better highway for him to build. At least, there probably will be no occasion to air condition the area of an atom-bomb blast for quite a few years after the incident occurs.

The freshman, or even the junior, who failed a subject, will find that an obstacle has been placed in his path. As an engineer, taught to analyze his problems, he will come to the conclusion that he cannot progress further until he makes up the course, and he will proceed to take the course again, immediately. A delay, possibly a temporary defeat, cannot prevent the man who really wants to be an engineer from going on. He will continue to work hard doing everything the delay does not prevent, until he has corrected for it, and then he will resume work on the main line as quickly as possible.

As events progress toward the period of armed service which this same man is to serve, he will work as hard as possible until the last day of school which is granted him, before taking time out to overcome the new obstacle. Most important of all, immediately after the new obstacle is overcome, he will return to pick up the main thread of his interrupted study. Such is the procedure he would use on an engineering problem, and long ago he decided that he would be an engineer, regardless of obstacles.

# The Ladder to the Top

**by Charles H. Plyer, Jr.**

*Undergraduate in Mechanical Engineering*

For generations the answer to the question "How can I rise to the top of the management profession?" has been the object of lifetimes of search. Many men have found their answer in every generation, and of these who have succeeded, many have left detailed accounts of the factors which they thought led to their success.

It might be thought that the best place to go for advice on success would be one of these successful men. As a matter of fact, much valuable information can be gotten from this source. Unfortunately, however, none of these men has divorced the principles of succeeding from the specific situations which he faced in his own rise. Further, times and the trend of legislation have changed so much that many policies recommended by successful men of the past are not only not practical now, but actually illegal.

In one of the early classes of the 1950 course in Management Problems at the George Washington University, F. M. Feiker, Dean of the School of Engineering, remarked that the trick in succeeding as an executive was to FIND THE LADDER UP which existed in every business, and to point oneself up this ladder. He mentioned the common experience of seeing hard-working, able men passed by those who were no more able, and who worked no harder. The difference was that the man who rose had FOUND THE MANAGEMENT LADDER in his company.

This paper will attempt to give an idea on how to find the management ladder up, and also to distill some of the principles of climbing the ladder from the writings of successful men and experts who have made this their study.

Before starting off on our search for the "ladder up," there is an important preliminary. It is a thorough and honest analysis of oneself. We must know our capabilities and limitations, and we must answer the question: "Do I really want to be an executive?"

The world's scarcest species is the leader. The old expression which says "There's always room at the top" is not just rhetoric. H. W. Gilb, an executive of the Great Atlantic and Pacific Tea Company, recently said: "It is becoming increasingly difficult to find leaders—men and women to undertake heavy responsibility in business and industry."

Men at the top of the ladder are a thrilling sight—especially to us Americans. Many of us envy them. But before you go in search of the "ladder up," stop and take a long look back of the glamour. Look at the day-to-day life these men had to live to get to the top. There are few "beers with the boys," little bowling with the wife, no Sunday golf except for strictly business reasons. There is studying instead of the baseball game. There is also the family problem—unless your wife is really unusual, she probably won't understand. She'll have to see your money spent on the things you need for success, rather than on the things she wants.

Even when you reach the top, things aren't as rosy as they seem from the sidelines. The president of a well-known automobile manufacturing company has said: "I pay my executives $100,000 per year, on the theory that they'll kill themselves working within ten years." Of course, you need not kill yourself, but the occupational hazards definitely include ulcers and nervous breakdowns.

Do you really want to be an executive?

If you have answered "yes" to the above question, there remains one more which must be answered before we start on the search for the "ladder up." This is: "What are my capabilities and limitations?"

This is a question which we cannot answer for ourselves. Fortunately, the science of psychological testing has come of age within the last few decades, and it is now possible to tell with a fair degree of accuracy what one's capabilities are. A complete discussion of the procedures used and some actual tests can be found in "The Psychology of Selecting Employees," by Dr. Donald A. Laird, of the Human Engineering Institute. We here at George Washington University are fortunate in having the Vocational Guidance office. This office has an expert staff and its battery of tests, which require four days to complete, gives a very good profile of one's tendencies and abilities. The cost of the tests is twenty dollars, and it is money well spent. The service is free to veterans. This series of tests also answers the question of whether you really are interested in becoming an executive, and its answer is more dependable than our own. It is not dazzled by glamour.

An interesting aspect of individual differences is pointed out by Dr. Daniel Starch, well-known psychologist, who said:

> ". . . all human beings have the same reflexes, instincts, and capacities; all have the same powers of perception, discrimination, attentiveness, retentiveness, reasoning, and so forth . . . The variations from person to person are, therefore, primarily in the strength of the various abilities that each individual possesses."

This is why each of us can, with only a slight twinge

of conscience, answer each question so as to give ourself a good score in self-administered personality tests.

Once we have found out our own abilities, we must have a standard against which to measure them, in order to assess our fitness for a job in the executive stratosphere. There are many good books which will help us do this. One of the best and most modern of these is "Climbing the Executive Ladder" by George J. Kienzle and Edward H. Dare. When comparing yourself with the standards set up in this or similar books, ask someone who knows you well to help you. Your wife will usually do a far more realistic job than you yourself.

Do you have the capabilities necessary to be a successful executive?

Well, if the answer to both of the preliminary questions have been "yes," there is every prospect that the top of the executive profession is within your reach. The next step is to go in search for the "ladder up." First, we shall want to know when to look for this ladder. Next, we shall want to know where to look for it, and finally, how to look for it.

The answer to our first question is simple. If you are not employed now, you have a golden opportunity to do a little preliminary looking while you are looking for your job. Shop around. Don't take the first job that is offered to you, just to have a job. Analyze your prospective employer carefully; it is the first and most important step in your search for the "ladder up." Is the company making money? Will it weather hard times if they come? Is it progressive? Does it recognize good men and women, and does it advance them on merit? Does it bring in new blood for most good jobs? A little investigation will give you the answers to the above questions. If the answers are all "yes" except for the last one, you have narrowed the field considerably. Somewhere in that company is the ladder for which you are looking.

If you are now employed, there are a few more questions you must ask. Have you already been with the company too long to expect advancement? Are you already pigeonholed in management's mind as a fellow who won't go very far? In spite of all honest efforts to the contrary, are you behind the eight-ball in your company? A "yes" answer to any of these questions must be a signal for you to take your courage in your two hands and find another company that meets the qualifications of the preceding paragraph. The answer to "When?" in this case is "Now!"

We seem to have answered the question of where to look also, and in a very broad sense, we have. It is somewhere in the good company which you have chosen. However, this company is usually a very large haystack, and our "ladder" is, comparatively, a very small needle. Here are a few suggestions on where to look for it.

First, confine your search to the management structure of the company. A classic case of one who failed to do this comes to mind. He set out to prove to management in one of the local utilities that he was a leader. For the last ten years he has "knocked himself out" working his way to the top of every employee activity the company sponsors, and they are many. He has made a very good case for his ability as a leader, but he is still in his original job. His weak point is that he hasn't demonstrated interest in the company's progress, but only in his own.

Another cardinal principle is to look into your own mind. Develop the feeling of management as a profession, with a duty to company, public, and country. Realize the fact that management is a science which is not limited to any one business, nor to any one field. Dean Feiker has said that in every business there are two kinds of executives, each needing the other. There is the tough, driving type, who "gets things done." There is also the smooth public relations expert who calms the troubled waters stirred up by our man of action. Balanced companies have both; when one is president, the other is chairman of the board. Decide early which of the two you most honestly represent. Pick out the top man of your type in your company and study him. Very probably his background will show you your "ladder up." It's a good place to look.

Now that we have established when and where to look, let's talk for a while about how to look.

The most important thing here is to get the viewpoint of the management in your company. In your zeal to impress the boss, you run the danger of wasting effort on projects which do not further the company's policies. Like the man in the poem, the tendency is to "jump on a horse and ride madly off in all directions." The company history is easily obtained, as is its reputation in the community. Both of these give really important slants on traditional policies. Speeches by top executives are another source for determining current policies. You may, if you are fortunate, be in a position where you can see occasional decisions made by top executives. From these data an intelligent analysis will give a good idea of management viewpoint and policy.

After you have accomplished the foregoing, you are ready to begin an active search for our elusive "ladder up." Most important here is a PLAN OF ACTION. It is really surprising how few people actually sit down and plan their moves in life. All too many restrict their thinking to specific projects assigned by professor or supervisor, and drift aimlessly on to an unknown destination in their own life. By simply sitting down and making a logical, reasonable plan of action, you have already passed over nine-tenths of those with whom you are competing. Look around and pick out the job you think would be a good start for the top, and prepare for it.

*(Continued on page 21)*

# Mercury Steam Generation

**by Frank A. Yeide, Jr.**

*Undergraduate in Mechanical Engineering*

In 1950, 329 billion kilowatt hours of electrical energy were produced in the United States. Of this tremendous amount of power, approximately 224 billion kwhrs were produced in steam generation stations at a fuel cost of 835 million dollars. The average fuel rate was 1.22 pounds of coal per kwhr or an overall thermal efficiency of 19.4 percent. A small improvement, percentage-wise, in this efficiency would save a great deal of fuel and money. Since efficiencies were even lower years ago, engineers have long sought methods of improving the efficiency of the heat cycle.

There are two thermodynamic methods of increasing the efficiency of a power cycle. One method is to make available for work more of the internal energy of the working fluid by expanding it to lower temperatures. Since condensing temperatures are determined by the temperature of the coolant used in the condenser, the sink temperatures being between 40 F and 100 F, a condensing temperature of 80 F has been established as the normal minimum. Expansion of steam to this temperature has effectively been accomplished. The other method of improving cycle efficiencies is the use of higher initial temperatures before the fluid enters the turbine. Engineers have thus increased initial operating temperatures to 1050 F which is the present operating temperature limit of commercial steam turbine materials. Many modern steam generation stations operating between these temperature limits have fuel rates of approximately 0.8 pounds of coal per kwhr or a thermal efficiency of 29 to 30 percent. It is expected that improvements in turbine materials will permit the use of higher operating temperatures and thus improve efficiency. At this point, however, engineers, in applying these high temperatures to steam cycles, have encountered several undesirable thermal characteristics of water.

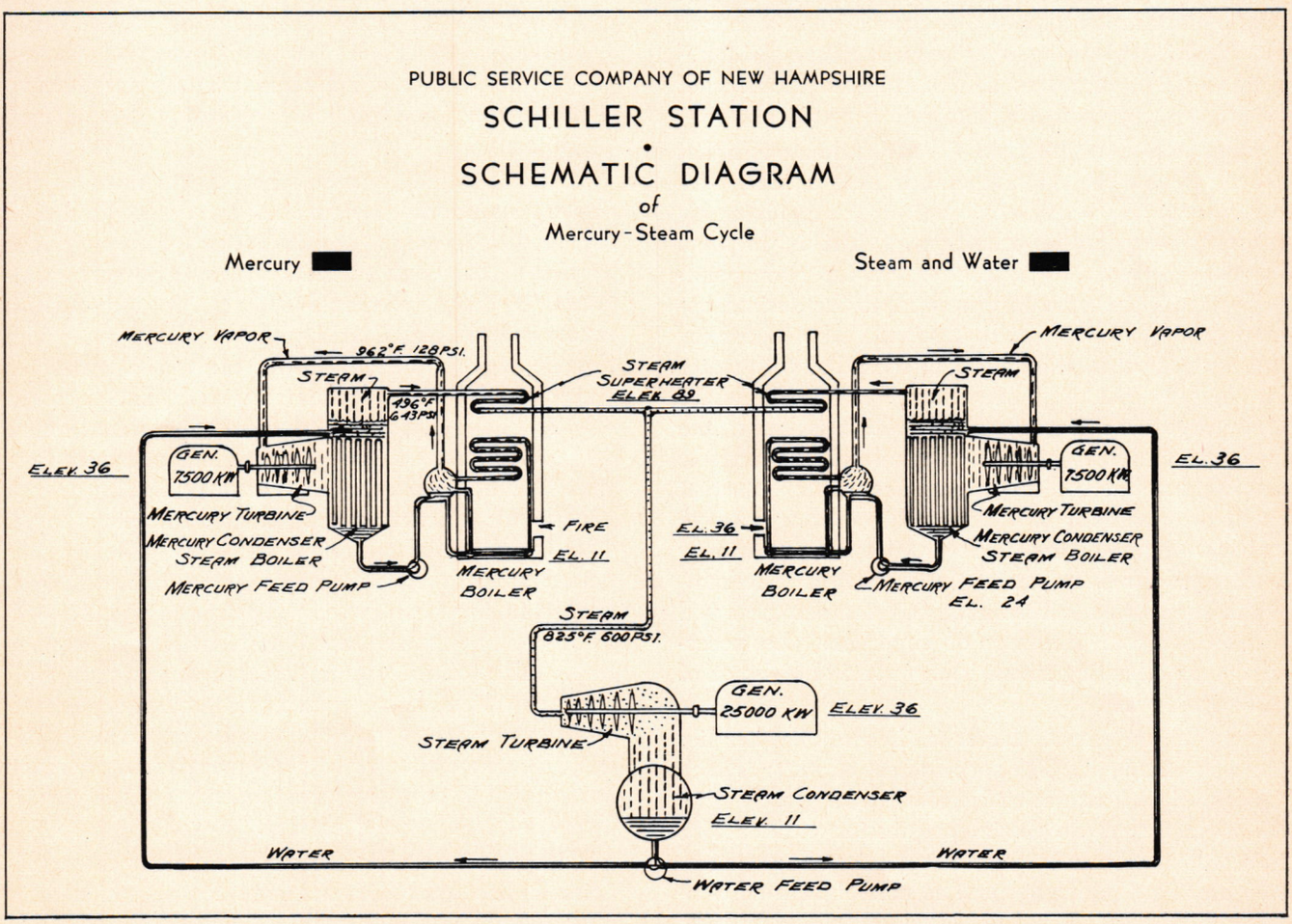



*Fig. 1. Schematic diagram of equipment at the Schiller Station of the Public Service Company of New Hampshire.*

Thermodynamically and economically, water has little competition as a working fluid in heat equipment operating between a saturation temperature of 445 F at a pressure of 401.7 pounds per square inch absolute and the normal condensing temperature of 80 F at a vacuum of approximately 29 inches of mercury. For high temperature operation, 500 F and above, however, water has several disadvantages as a working fluid. One of these and perhaps the most objectionable is the property of low saturation temperatures at correspondingly high pressures. For example, at a saturation temperature of 500 F, the vapor pressure is 680.8 psia; at a saturation temperature of 605 F, the vapor pressure increases to 1601 psia; and an increase of the saturation temperature to only 685 F results in a vapor pressure of 2800 psia. Thus, in order to attain the high saturation temperatures desired, 500 F and above, vessels capable of withstanding very high pressures must be used in the cycle. Such equipment is complicated to design, expensive to construct, and reduces the desirability of water as the fluid.

There are several 2500 psia installations in existence at the present, but there is a definite limit as to the pressures that can be used in the cycle. Water cannot exist as a liquid above the saturation temperature of 705.34 F at a pressure of 3206.2 psia regardless of further increases of pressure. Consequently, both the highest practical pressure and the highest possible saturation temperature have been established. Since initial operating temperatures above 705.34 F were desired, engineers had to consider methods of attaining temperatures higher than the critical.

Examination of the ideal Carnot cycle reveals that the most efficient method of attaining a high temperature is the addition of heat to the fluid during constant temperature conditions. That is, increase the fluid pressure to a point where the corresponding saturation temperature is equal to the desired operating temperature and then add the necessary amount of heat to reach it. It is seen that with water the highest operating temperature attainable under these conditions is the critical, which is below the desired initial temperatures. Because of this fact, the less efficient method of adding heat under constant pressure conditions to a saturated vapor at a lower pressure—superheating—is used. Since the efficiency of this process decreases as the amount of superheating increases, and increases in initial temperatures will demand further increases of superheat, the necessity of superheating steam is an undesirable factor of the steam cycle.

Another undesirable factor in the use of water lies in its specific heat. The specific heat of water is such that the liquid saturation curve deviates greatly from the ideal Carnot adiabatic compression curve. This indicates that expensive and complicated regenerative heating equipment must be used if high efficiencies are desired. The heat of vaporization of water, 1048 Btu per pound at 80 F, is lost to the coolant during the condensation process. Little can be done about this except the replacement of water with a fluid having a lower latent heat.

A list of desirable characteristics for a perfect fluid to replace water in heat cycles is as follows:

1. The saturation temperature-pressure characteristic should be such that, at vapor pressures of not over 300 psi, the saturation temperature would be above or equal to the desired initial temperature. This would eliminate the need for high pressure vessels, and reduce the necessity for superheating.
2. The heat of vaporization should be low compared to that of water.
3. Condensation temperatures should prevail at desirable levels under atmospheric pressure to eliminate the need for maintaining high vacuums for the condensation process.
4. The specific heat should be such that the liquid saturation curve approaches the ideal Carnot compression and eliminates the need for regenerative heating.
5. The freezing point should be below the usual ambient room temperature to prevent solidification of the fluid when the unit it out of service.
6. The fluid vapor should not be toxic.
7. It should be available in large quantities and at reasonable cost.
8. The fluid should be chemically stable under maximum conditions of temperature and pressure.
9. The critical temperature should be well above the existing and proposed operating temperature limits.

Of the few fluids found that satisfy most of the above conditions, mercury is the most desirable for several reasons. It fulfills the prime requisite in that it has high saturation temperature at comparatively low pressures—670 F at atmospheric pressure and 1020 F at a pressure of 200 psi. The specific heat of mercury, only one-thirtieth that of water at 80 F and but one sixty-sixth that of water at 650 F, indicates that its liquid saturation curve approaches that of the Carnot adiabatic compression. Because of this, regenerative heating is not needed for efficient operation of a mercury cycle. The low heat of vaporizing, 125 to 130 Btu per pound at desirable condensing temperatures, favors its use in the heat cycle. The freezing point, –38 F, is well below the usual ambient room temperature. The critical saturation temperature is well above existing or proposed material temperature limits. Mercury is an element and there is no possibility of dissociation at high temperatures. Mercury has negligible corrosive effect upon metals in use in heat equipment at the present.

Though mercury has these advantageous characteristics, it has some disadvantages for operation as a replacement fluid for water. Because mercury is

toxic in the vapor form, a system using mercury must be very carefully constructed to prevent leakage. The cost and availability of mercury must be considered if it is to be used in large quantities. At the present time, mercury is expensive and production is low. As mercury does not readily wet the surface of materials in use today, some treatment of it must be made to improve its heat transfer characteristics. Small amounts of titanium and magnesium added to the mercury have been found to remedy this condition. At very low pressures, 0.4 psia, the saturation temperature of mercury is quite high, 402 F, making expansion to such pressure undesirable.

A binary cycle has been devised making use of the best thermodynamic characteristics of water and mercury. In such a cycle, mercury is used in the high temperature portion of the cycle because of its low pressure-high temperature characteristic. Because of its condensing properties, water is used in the lower temperature section of the cycle. As is shown in Figure 2, no superheating is used in the mercury system,

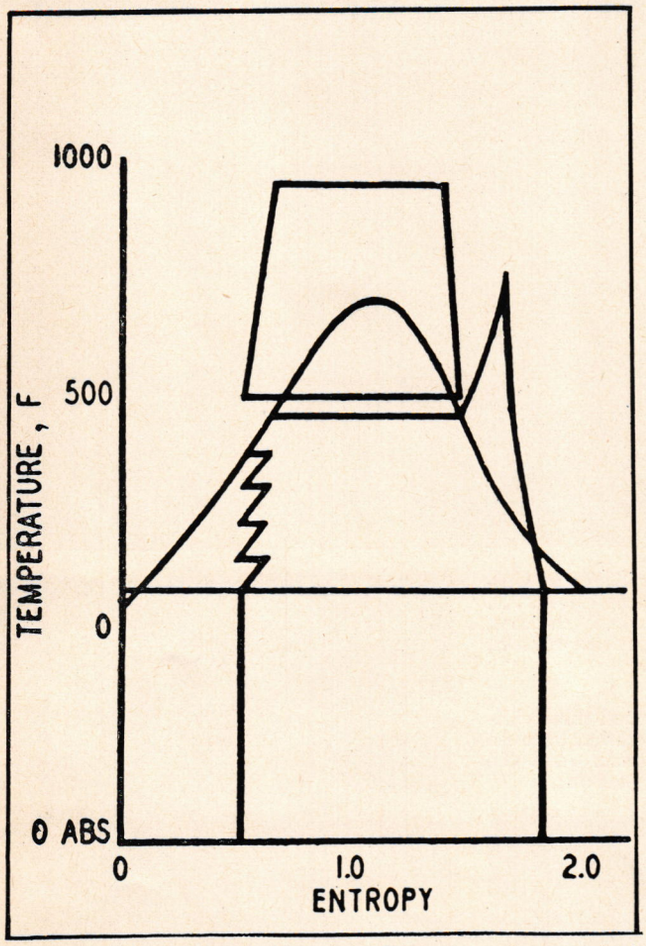



*Fig. 2. Temperature - Entropy Diagram of a typical binary cycle employing mercury and water as the working fluids.*

but both superheating and regenerative heating are employed for the water section. The rejected heat of the mercury is used to heat water in the steam section. This cycle is not only very efficient but it is entirely practicable for use in power generation work.

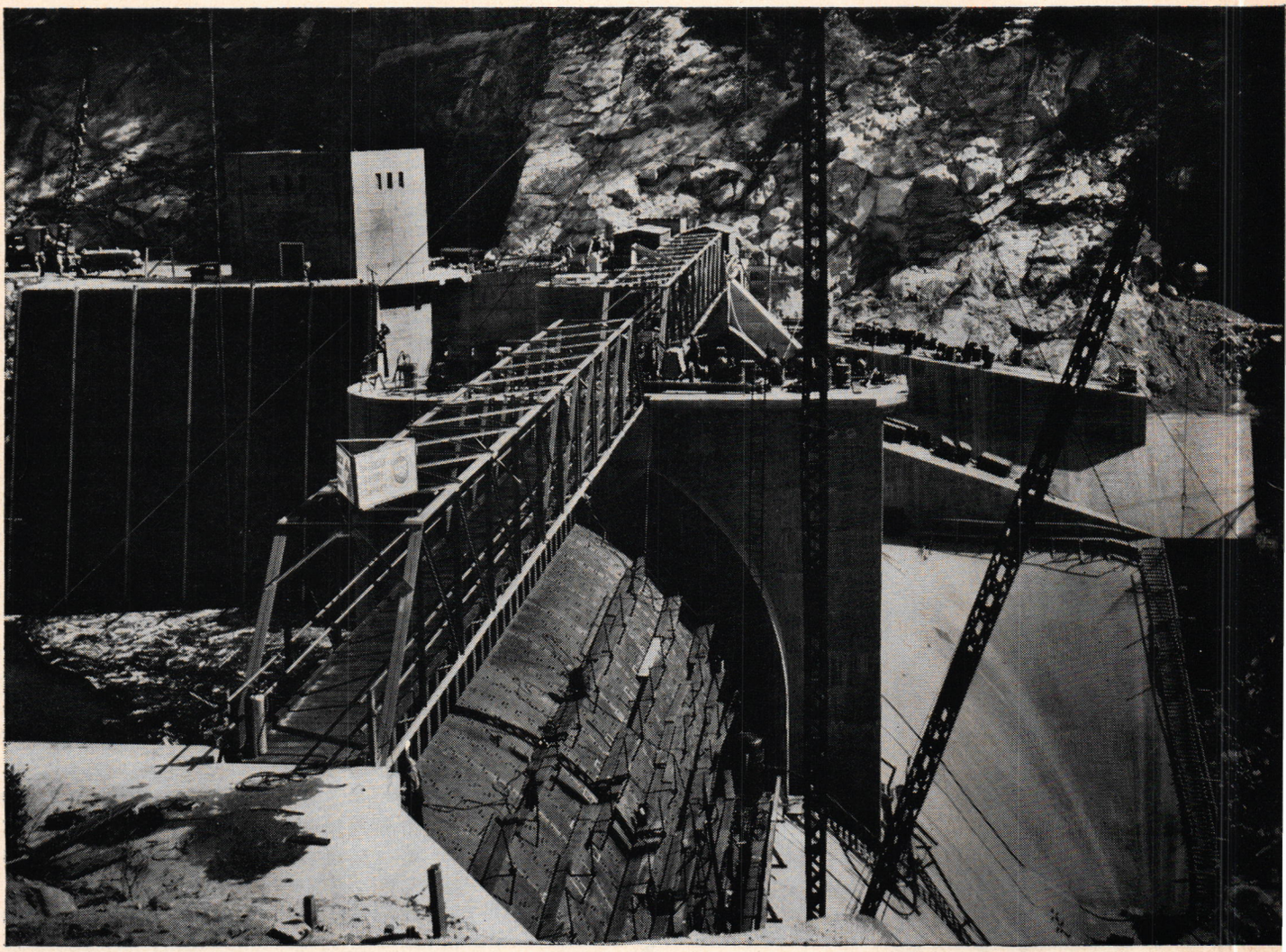
This mercury-steam binary cycle has been successfully applied as a heat cycle in several commercial electric generation stations. The Schiller Station of the Public Service Company of New Hampshire located at Portsmouth is the most recent installation employing such a binary cycle. Because of its comparatively high efficiency, the mercury-steam cycle was selected for the new station to alleviate the problems of unreliable hydro-electric power and high fuel costs. The 40,000 kw capacity Schiller Station, placed in service January 18, 1950, was built by the General Electric Company. The plant is designed to be one of the most efficient fuel burning stations of its size in the world.

The Schiller Station utilizes two independent mercury systems and one steam system in the cycle. A schematic diagram of the Schiller Station is shown in Figure 1. Each mercury system has the following equipment: one mercury boiler furnace, one standard design mercury turbine, and one mercury condenser boiler unit. The mercury is vaporized in the mercury boiler furnace at a saturation temperature of 962 F and a pressure of 128 psi. The mercury vapor thus produced is expanded in the 7500 kw mercury turbine to a back pressure of approximately 2 psi and a temperature of approximately 500 F. Having released some of its energy in the turbine, the mercury is exhausted to the mercury condenser boiler where it is condensed. Since the cooling water for the mercury condenser is actually water from the steam system, the latent heat of the mercury is used to vaporize this water for use in the steam turbine. A temperature differential of 30 F is maintained between the mercury and the water in the mercury condenser boiler in order to obtain economic heat transfer. The condensed mercury is pumped back to the mercury boiler furnace for reuse in the cycle.

The water in the condenser boiler is vaporized by the latent heat of the condensing mercury and leaves the unit as saturated steam at a temperature of 496 F and a pressure of 643 psi. This saturated steam is routed to a mercury boiler furnace where it is superheated to a temperature of 825 F. The steam headers from each of the mercury boiler furnaces are joined, and the total amount of steam produced enters the steam turbine at a final temperature of 825 F and a pressure of 600 psi. The steam is expanded in a 25,000 kw turbine and is condensed in the regular manner. After being condensed, the water is pumped to one of the mercury condenser boilers for reuse in the cycle. Typical regenerative heating equipment is used to improve the efficiency of the cycle. All of the equipment in the steam portion of the plant is of standard design. No conventional steam boiler is used, but its functions, vaporization of water and superheating, are accomplished in the mercury condenser boiler and the mercury boiler furnace respectively.

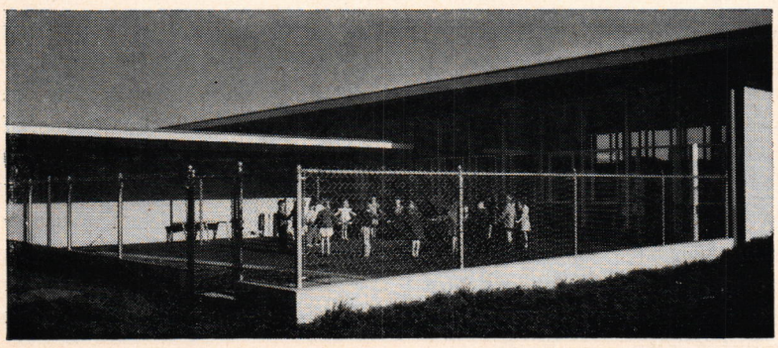
*(Continued on page 18)*

# Only STEEL can do so many jobs



**ACTION IN CALIFORNIA.** On the north fork of the Feather River in California, Pacific Gas and Electric Company has placed two new dams . . . Cresta Dam and Rock Creek Dam. The huge drum gates for these dams, and the bridges directly above them, required 4,380,000 pounds of steel. They were fabricated and erected by United States Steel.

**NEW SCHOOL HAS 2-WAY PROTECTION.** No matter how absorbed these children become, they can't rush into the path of passing traffic, because they are protected by sturdy, long-wearing Cyclone Fence. And the fence not only keeps the children inside, it keeps undesirables out.



**WASH DAY IS NO HEADACHE** in hospitals, hotels, restaurants, clubs, or laundries where equipment is made of U·S·S Stainless Steel. For stainless steel means easy cleaning, corrosion resistance, good looks and long life. Lucky that United States Steel is big enough to turn out steel for washing machines as well as warships, for toasters as well as tanks.

AMERICAN BRIDGE COMPANY • AMERICAN STEEL & WIRE COMPANY and CYCLONE FENCE DIVISION • COLUMBIA STEEL COMPANY • CONSOLIDATED WESTERN STEEL CORPORATION
UNITED STATES STEEL COMPANY • UNITED STATES STEEL EXPORT COMPANY • UNITED STATES STEEL PRODUCTS COMPANY

# so well...

**TOUGH ON TANKS.** The steel rocket fired by this new 3.5 inch "superbazooka" has already proved itself an effective anti-tank weapon. It weighs nine pounds, is able to penetrate up to 11 inches of armor. Although mobilization will require increasing amounts of steel, the constantly-expanding steel-producing facilities of U. S. Steel should enable it to make plenty of steel for essential peacetime uses, too.

**NEW LIGHT ASSAULT TRANSPORT.** Six rocket units help to lift the 40,000-pound weight of this new U. S. Air Force light assault transport in a recent test flight. With the addition of rocket units, the three-engine plane can now transport heavy loads in and out of small clearings. Only steel can do so many jobs so well.

**FACTS YOU SHOULD KNOW ABOUT STEEL**

American steel mills can out-produce the rest of the world combined by 13 million tons of steel a year. The plants of United States Steel alone are pouring more steel than all the Communist nations put together.

**Listen to . . . The Theatre Guild on the Air,** presented every Sunday evening by United States Steel. National Broadcasting Company, coast-to-coast network. Consult your newspaper for time and station.

MANUFACTURED FROM USS TRADE MARK STEEL UNITED STATES STEEL

**. . . and this label is your guide to quality steel**

# UNITED STATES STEEL

*Helping to Build a Better America*

GERRARD STEEL STRAPPING COMPANY • NATIONAL TUBE COMPANY • OIL WELL SUPPLY COMPANY • TENNESSEE COAL, IRON & RAILROAD COMPANY • UNION SUPPLY COMPANY
UNITED STATES STEEL SUPPLY COMPANY • UNIVERSAL ATLAS CEMENT COMPANY • VIRGINIA BRIDGE COMPANY

**USE THE WORLD'S BEST at NO EXTRA COST**

**Begin your career by doing what the masters do . . . use CASTELL with the famous *imported* graphite. It costs no more than ordinary domestic brands.**

**18 superlative degrees that match every mood of genius. Ask for CASTELL 9000 at your college supply store.**

A.W. FABER-CASTELL PENCIL COMPANY INC., NEWARK 4, N.J.


## SOCIETIES AND FRATERNITIES

● The regular meeting of the Institute of Radio Engineers Student Branch of George Washington University on January 10, 1951, was held jointly with the American Institute of Electrical Engineers. Mr. Gordon H. Lester, Radio Engineer in Charge of the National Bureau of Standards Radio Station WWV, explained the standard frequency and standard time signals broadcast by the station. He elaborated on the purposes, methods of operation, and derivations of these standards. A business meeting was not held on this night.

After the January finals, a number of members made an inspection trip through the United States Naval Observatory, thereby gaining further information on standard time. The group viewed numerous telescopes and their associated mechanisms, discussing the operations and functions of the detailed components.

Additional field trips are planned in the near future, with more emphasis on the electronics field. Lectures will also be given on this subject at later meetings of the IRE during the school year by authorities prominent in their field. The next regular meeting will be held on March 7th. The program for the March meeting will be announced later.

● The mid-January meeting of Sigma Tau included in its agenda the election of two new Engineers' Council representatives and a new corresponding secretary. After a close ballot, John Lewis was chosen the successor of graduate Willis Vary whose term expires in May. The new "staggered election" amendment of the Council was approved by the assembly. Herman Norwood, treasurer of IRE, was then elected to hold office until February of next year as Sigma Tau's first delegate under the new system. P. Michaelson is the new corresponding secretary of the organization, succeeding John Clancey who also graduated this month.

The program for selection of new members for spring initiation was begun at this meeting. Final plans were formulated for the winter term dance which was held on February 10th at the Cameron Club in Alexandria. A gala time was had by all those in attendance. Adequate refreshments were served and the dance music of a local orchestra was featured.

Meetings during the coming month will feature final selection of those students to be initiated in mid-April.

● After the all-engineering meeting of December 1, 1950, when Dean W. L. Everitt of the University of Illinois spoke on color television, the ASCE Student Branch held an informal business meeting. The most important business of this short meeting was the election of Tom Mutchler as the new Engineers' Council representative from ASCE.

On January 4th a joint meeting was held in conjunction with the ASME. At this meeting Mr. Bruce Herman, resident engineer on the Chesapeake Bay Bridge project, discussed details of the bridge construction and showed slides. This was followed by a film showing construction details of the Golden Gate Bridge.

On January 14th a special meeting was held for the nomination and election of the junior representative to the Engineers' Council. Treasurer Dick Caldwell was elected to the post.

The February 7th meeting was another joint ASCE and ASME meeting. Robert Harwood and George Collins, G. W. engineering students, spoke on fiber-glass boats and demonstrated by molding the hull of a model.

The D. C. Section of ASCE will hold their annual dinner on March 7th at the Officers Club of the National Naval Medical Center, Bethesda, Md., and student members who desire will attend. There will be no student chapter meeting on that night. ASCE National President G. A. Hathaway will be the guest of honor at the banquet and speaker of the evening. The price is $2.50 and the program, food, and atmosphere will be excellent.

● Theta Tau, the professional engineering fraternity, completed its rush season last semester with the initiation of seven new members. The rush season for the current semester has now been completed, and a new crop of pledges is undergoing training prior to initiation, which will take place on March 17. After the initiation, a dinner-dance will be held for the new members and their dates, with actives and alumni welcoming the new men.

During the Christmas holidays, Tom Mutchler went to Kansas City for the Biennial Convention as the delegate from Gamma Beta chapter here at George Washington University. For the second straight time the George Washington delegate was voted the outstanding delegate at the Convention as Don Blanchard won that honor two years ago.

Members of Theta Tau, feeling that engineering students do not participate in all-University activities as much as they should, have been following a pattern aimed at increasing such interest this year. As a part of the program, a team was entered by the fraternity in the bowling league, and won first place over Sigma Chi in January.

● The George Washington University Branch of the AIEE will hold its annual prize paper contest at its next meeting on March 7, 1951. The winner of this contest will receive a Certificate of Award, $10 in cash, and a travel allowance of eleven cents a mile to the District Branch contest to be held this year at Villanova College. The winner of the District contest will receive a $25 cash award and a chance to compete in the national contest for the $100 cash prize.

Here is an excellent opportunity for some enterprising student to convert a little of the toil and tears that went into the creation of that seminar paper into something of a more negotiable nature. The only requirement for eligibility is that you be a member of the National Institute. So dust off that paper, and ask Professor Antel to enter your name as a contestant.

Another event we have all been looking forward to from last year is coming on March 13th. This is Student Night, an annual dinner presented by the engineers of the Washington Section so that they can get better acquainted with the members of the local student branches. The dinner last year was held at Catholic University, and anyone who attended will assure you that the food was excellent, the company stimulating, and the entertainment literally hair-raising when Dr. Richard Hitchcock sat down on a 3-foot, 250,000-volt model of Westinghouse's 4,000,000-volt generator.

The dinner is free of charge to local members who have paid their current branch dues. Others may attend by paying either the local dues of $1 or a $1 fee for the dinner. Pay your local dues and go to the dinner free.

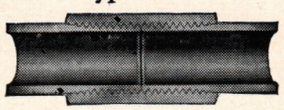
● After a joint meeting with the ASCE on January 4th, at which the resident engineer spoke on the Chesapeake Bay Bridge project, the ASME Student Branch held elections to fill two unexpired terms of office. Chris Brown was elected Secretary vice Richard Kiester, and Charles Jackson was elected to the Engineers' Council vacancy caused by the resignation of Robert Curtis. Samuel Taylor was elected representative to the Engineers' Council to serve until February, 1952, in accordance with a new provision of the Engineers' Council Constitution.

The February meeting was highlighted by a talk on the construction of fiber-glass boats presented by Robert Harwood and George Collins, both student engineers at G. W. The talk included a demonstration in which a model fiber-glass hull was molded before the audience, a joint assembly of the ASME and ASCE Student Branches. Distinguished guests included Vice-President U. S. Grant, III, and Dean C. H. Walther.

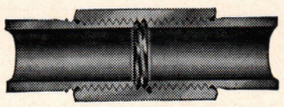
The most important note on the agenda at present is the annual competition held at the Regional Student Conference of the ASME, which will take place on the April 20th weekend at the University of Pennsylvania. Representatives from the student branches of schools within the region will compete in the presentation of engineering papers. The competition for our student branch representative will take place at the regular March 7th meeting and on March 28th, if there are many entrants. For details contact Chairman Yeide, Vice-Chairman Petrolino, or Professor Trumbull.


*No. 3 of a Series*

**When two lengths of electrical conduit are joined together, ordinarily the point of coupling becomes the weakest part of the run. For this reason the coupling is all-important. And for this reason a Sherardized coupling has special advantages over other types.**



SHERARDUCT COUPLING



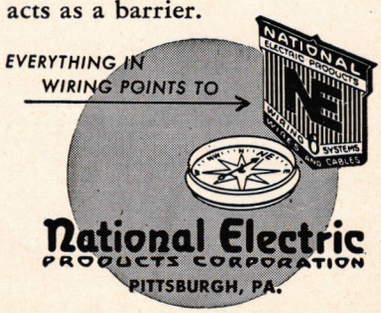
ORDINARY COUPLING

**A Sherardized coupling is galvanized *after* the threads are cut—every thread is zinc protected against rust equally with the outside surface.**

**The shoulder on Sherarduct couplings is a further safeguard. It covers and protects the final threads so that no raw threads will be exposed to moisture and other corrosive weather conditions.**

**Sherarduct conduit threads are so cut and couplings so tapped causing conduit to butt, that together they form a practically continuous raceway through which wires may be drawn without difficulty or injury.**

**Here at the joint, unless perfect continuous grounding is assured as it is with Sherarduct, rust first begins its resistance activity and acts as a barrier.**



# ALUMNEWS

*Dick Koester*, BCE 50, is now down in Salisbury, N. C., taking care of a large government project for R. Floyd Jennings and Son, plastering contractors. Big Dick visited Washington last month and attended the Engineers' Ball.

———

*James A. Kelley*, BS in CE 28, and CE 36, is employed as a Research Engineer with the U. S. Bureau of Public Roads at their research station in Arlington, Virginia. His specialty is soils and foundations for pavements, and several of his reports on these topics have appeared in the Public Roads magazine and other highway publications. During the war Jim worked on special airport problems at Washington National Airport, Bolling Field and Idlewild Airport. His work requires considerable travel, but his permanent residence is still at 1011 Massachusetts Avenue, Northeast.

———

*L. B. Proctor*, BME 50, is now with the Kellex Company in New York City. Barney is a former staff member of Mecheleciv, and we are waiting for him to drop us a long letter giving all the current information on himself.

———

Recent graduates returning for the winter mixer included *John P. Connor*, BEE 50; *Fred R. Lewis*, BME 49; *Hillis McGee*, BCE 49; *Tom Shipp*, BME 50; and *Vincent Toal*, BME 50. This pleasant practice of having alumni drop in for the mixers provides a feeling of continuity in the Engineering School that both present and former students seem to enjoy.

———

*O. G. Magruder*, BS in CE 16, tells us that he is still with Hudson Supply and Equipment Company. After working as an Engineer in the District of Columbia Building Inspector's Office for four years after graduation, Magruder was employed by a local subcontractor, and later by a North Carolina builder. He joined his present firm in 1928, and is now residing at 3002 Porter Street, Northwest. Mr. Magruder now has two grown children; one son and a daughter.

*William P. Couper*, formerly an Engineers' Council delegate from IRE, and Social Chairman of the Council during the fall semester of this school year, sends greetings from Camp Lejeune, where he is stationed after being recalled to active duty with the U. S. Marine Corps.

———

Through the efforts of *George C. Cunney*, the National Capital Area Alumni Association of Theta Tau has made a twenty-five dollar contribution to the Engineering Alumni Association fund for Mecheleciv. The Engineer Alums are trying to provide five hundred dollars a year for the block subscription to the magazine, and this contribution was a big help. Thanks, fellows!

———

*Bill McMakin*, having completed his basic training in the Army, is now stationed at Fort Belvoir with the U. S. Army Engineers and gets into town on a pass occasionally.

———

*Richard G. Daniels*, BEE 50, was married to Cynthia Anne Phillips this past December 20th at Cleveland Park Congregational Church here in Washington. Dick, another former Mecheleciv staff member, says they will make their home here in Washington. Congratulations, old man!


**BROWNLEY'S BAR AND GRILL**

SPECIALIZING IN

LUNCHEONS — DINNERS — MIXED DRINKS

2134 Penna. Ave., N.W. ST. 9778

**Tendler's Pawnbrokers' Sales Co.**

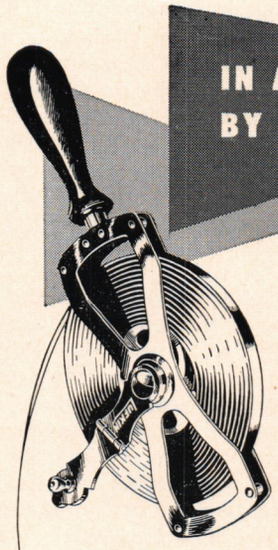
(Established 1911)

913 D STREET, N.W. WASHINGTON, D. C.
Phone: MEtropolitan 9339

CLOTHING - JEWELRY - LUGGAGE - TYPEWRITERS
DIAMONDS - CAMERAS - FIELD GLASSES - FIREARMS
MUSICAL INSTRUMENTS - DRAWING INSTRUMENTS

—IT PAYS TO LOOK WELL GROOMED—

**FRANKIE'S**
**BARBER SHOP**
2032 EYE STREET, NORTHWEST



IN A CLASS BY ITSELF!

LUFKIN

"MICHIGAN" CHROME-CLAD BABBITT TYPE CHAIN TAPE

It's in a class by itself for railroad, highway, and other hard service measuring. Tough steel line protected with several coats of electroplating. Both line and Babbitt metal bosses chromium plated to give it a wear and corrosion resistant, all metal outer jacket. Sturdy metal reel is dull black finished. Long extra-leverage folding winding handle. It pays to measure with the finest—choose *Lufkin*.

121

BUY LUFKIN

TAPES • RULES • PRECISION TOOLS
AT YOUR HARDWARE STORE

THE LUFKIN RULE CO. • SAGINAW, MICH. • New York City • Barrie, Ont.

# NEWS AND VIEWS

## NINETEENTH ANNUAL BALL

The Nineteenth Annual Engineers Ball was held Saturday, February 24th, at the Washington Hotel Hall of Nations. Alumni, faculty members, students and friends joined in to celebrate the traditional dance, the highlight of the social season in the School of Engineering, and an all-University affair. Sociability was the theme of the evening and while people on the dance floor were swaying to the rhythms of the Alaskans Orchestra, others were enjoying conversation and refreshments at the tables scattered around the ballroom.

Although the members of the Engineers' Council, who sponsored the ball, were allowed only three hours to decorate the hall before the dance, they did a very fine job. A feature of the evening was the launching of some three hundred balloons from the ceiling. Three of these balloons contained the winning tickets for the door prizes.

Charles H. Plyer, President of the Engineers' Council, welcomed President Marvin and Dean Feiker and emceed the proceedings during the intermission, introducing some of the campus leaders in the School of Engineering.

Nine to one was the official time for the dance, but there were many who went on to attend private parties after the dance was ended.

## PROFESSIONAL REGISTRATION FORMS READY

Application forms and instructions on procedures for filing them, as established under Public Law 789 of the 81st Congress for the registration of engineers, are now available and may be obtained by writing to the Board of Registration for Professional Engineers at the District Building, Washington, D. C.

As established by the act, the Commissioners of the District have appointed the Board of Registration for Professional Engineers in the District of Columbia, and they were sworn in on December 21. The new Board consists of Daniel C. Walser, representative for civil engineers, and Chairman of the Board, a five year term; Leo H. Cleary, representative for the electrical engineers, and Secretary-Treasurer, a four year term; M. X. Wilberding, representing the mechanical engineers, a three year term; Martin T. Bennett, chemical engineers' representative, a two year term; Lee J. Purnell, member at large, a one year term.

The application blanks resemble the ordinary job application form that requires information on amount and type of education, experience, and a chronological listing of places of employment. The procedure for filing for registration is:

1. Write to the Board at the District Building as soon as possible. It is your duty to contact them; forms will not be sent out automatically.
2. The required forms, instructions, and a list of qualifications and requirements will be sent to you by return mail.
3. Fill out your application forms according to the instructions enclosed with the application. Be careful to supply all the information accurately. Describe your education and experience thoroughly. List all of your places of employment and the position held.
4. After you have completed the application, return it to the secretary of the Board together with the required fee and the necessary documents supporting your statements as specified by the instructions.
5. The Board will notify you of the next steps.

## THETA TAU BOWLERS WIN CUP

On January 13, the Theta Tau bowlers decisively defeated Sigma Chi in the finals at the Lafayette alleys. The engineers blasted the maple sticks for a 1538 set against 1394 for their opponents. Their victory won for the champions a large gold cup, while a smaller replica was awarded Tom Mutchler as individual champion.

Captain Becraft plans to enter his team again in the forthcoming spring competition to be staged in late March.

*Some of the IRE members did a little group singing at the Spring Mixer February 2.*


**BLADENSBURG BLUEPRINT SHOP**
*Blueprints, Direct Blackline Prints, Photo Prints*
4321 Baltimore Avenue
Bladensburg, Maryland
Phone: UNion 7950

**Firth - Hand & Company, Inc.**
Consulting Mechanical Engineers
Engineering Studies, Reports, and Valuations
for Agricultural, Civic and Industrial Projects
1744 K Street, N.W. REpublic 6628

**EMBASSY CAMERAS**
- MOVIE EQUIPMENT
- EXPERT ENLARGING-FINISHING
- GUARANTEED CAMERA REPAIRS
- FRAMES AND ALBUMS

HUDSON 7448 2010 S. STREET, N.W.

*(Continued from page 11)*

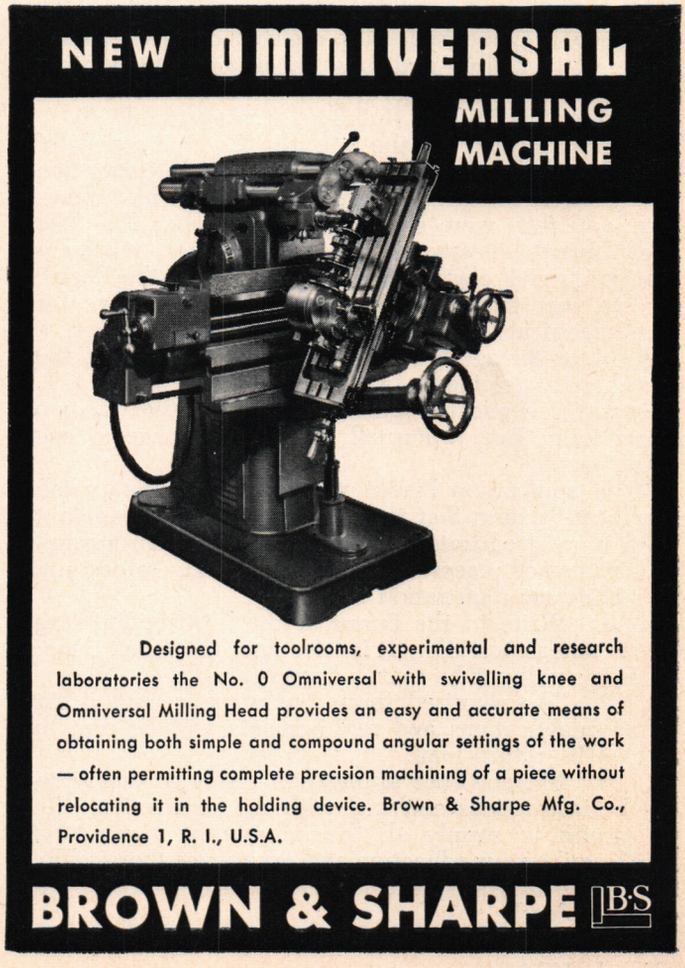
The station is designed to operate using approximately three-fourths the amount of fuel required by a similar size conventional steam station. Heat rates of 9420 Btu per kwhr for coal firing and 9200 Btu per kwhr for Bunker "C" firing are expected for rated load operation. The Schiller Station is operated as a base load plant enabling the power company to use a maximum amount of the 9200 Btu per kwhr power available, and thus improve the overall system efficiency.

Another application of a mercury-steam cycle has been made in the South Meadow Station of the Hartford Electric Light Company. The equipment, also designed by the General Electric Company, differs somewhat from that used in the Schiller Station, but the operating pressures, temperatures used and the results obtained are quite similar. In the South Meadow Station, only one mercury boiler furnace, built by Foster Wheeler Corporation, is utilized. The mercury vapor produced in the boiler at a pressure of 143 psi and a temperature of 978 F is admitted to one 15,000 kw mercury turbine. Some of the energy of the mercury vapor is released in the turbine and the vapor is then exhausted into two mercury condenser boilers at a back pressure of 1.5 psia and a temperature of 480 F. The condensed mercury is reused in the cycle. The mercury charge of 136,000 pounds is circulated through the cycle approximately 9½ times per hour, giving a total mercury flow of 1,640,000 pounds per hour. The mercury-steam flow rate is designed to be a minimum of seven pounds of mercury to one pound of steam.

As in the Schiller Station, the boiler water is circulated through the mercury condenser boilers and a total of 212,000 pounds of water per hour are vaporized at a pressure of 400 psi. The saturated steam is superheated in the mercury boiler furnace to a temperature of 700 F, expanded in a conventional 20,000 kw steam turbine, and condensed in the regular manner for return to the condenser boiler. The auxiliary equipment is of conventional design. The South Meadow Station operated its first 28 days at rated capacity with a heat rate of 10,200 Btu per kwhr or a thermal efficiency of 33.5 percent.

The greatest advantage of using a mercury-steam binary cycle lies in its high efficiency, ranging from 33 to 37 percent depending upon the equipment used and the conditions of operation. The mercury section of a binary cycle can be easily added to an existing steam installation which makes its use of even greater importance. The fact that a mercury-steam binary cycle has high efficiencies, a high operating temperature limit, and ease of installation as a topping unit for existing steam plants, makes it imperative that engineers interested in basically improving heat cycles and interested in topping units seriously consider its possibilities.

Stand for Quality
THE INTERNATIONAL STANDARD OF EXCELLENCE
SINCE 1880
HIGGINS
Higgins non-tip rubber base keeps your Higgins American Waterproof India Ink upright. . . . Ask your dealer for both.
HIGGINS INK CO., INC.
271 NINTH ST., BROOKLYN 15, N. Y., U.S.A.


NEW OMNIVERSAL
MILLING MACHINE
Designed for toolrooms, experimental and research laboratories the No. 0 Omniversal with swivelling knee and Omniversal Milling Head provides an easy and accurate means of obtaining both simple and compound angular settings of the work — often permitting complete precision machining of a piece without relocating it in the holding device. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.
BROWN & SHARPE

# Build Confidence ON BROAD EXPERIENCE

*by* ARCH COOPER
*Manager, Empire Region*
ALLIS-CHALMERS MANUFACTURING COMPANY
*(Graduate Training Course—1909)*

YOU NEED the confidence that comes from wide experience, whether you intend to be a salesman, designer, researcher, or production man. Confidence based on knowledge is one of the greatest assets an engineer can have. Here is what I mean.

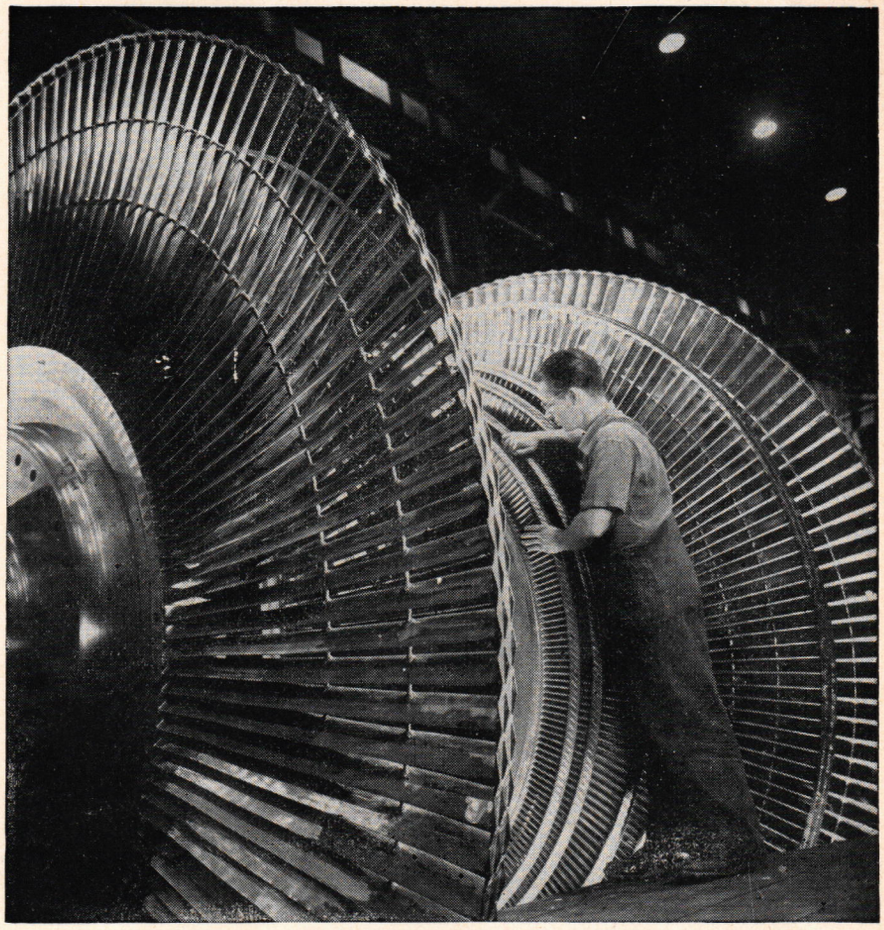
ARCH COOPER

You may visit a mine with the idea of talking about crushing equipment, but find that their engineers have an electrical problem. Or you may visit a utility to talk about electrical equipment and find that they're all excited about a pump break-down.

### Offer All-Around Help

Can you help them? Or are you just another peddler who is taking their time when they have problems on their minds. In my work I call on electric utilities, cement plants, machinery builders, textile mills, paper mills, shoe factories and many other types of plants. In each of them, I try to help the engineers and mechanics I call on.

It's a good credo for salesmen, but it takes broad experience to carry it out. It's the kind of experience you must deliberately set about acquiring as early as possible. I had heard of Allis-Chalmers equipment, seen A-C's giant Corliss engines in Australia's biggest power plant and decided to study design at Allis-Chalmers. It looked like the best place in the world to get a broad engineering background.



**High temperatures** and speeds raise tough design and production problems on giant steam turbine spindles like these.

I joined the Allis-Chalmers Graduate Training Course after graduation from Sydney Technical College in 1908 . . . worked on steam turbines, wound coils of all types, performed tests for the electrical department. After that there were field trips to erect electrical equipment. It was soon apparent that I wasn't a designer at heart, and my sales career started.

### Broad Opportunity

Forty-one years later, Allis-Chalmers still offers the same opportunity for broad experience. A-C still builds equipment for electric power, mining and ore reduction, cement making, public works, pulp and wood processing, and flour milling.

And the Allis-Chalmers Graduate Training Course is still flexible. Students help plan their own courses. They can switch to design, manufacturing, research, application, sales, or advertising—divide their time between shops and offices—and can earn advanced degrees in engineering at the same time.

Men at Allis-Chalmers get a close-up of the basic industries. No matter what path they take in the industrial world, experience gained with this broad organization lays a foundation for the confidence that comes with all-around knowledge.

**Textile mills** are getting adjustable speed at lower cost by using new automatic Vari-Pitch sheaves on spinning frames as shown.

**ALLIS-CHALMERS**

*Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin*

## Murphy & Ames, Inc.

Is Equipped To Supply Your Requirements of

- **Lumber**
- **Millwork**
- **Other Building Materials**

from yards located at

ROSSLYN
CH 1111

FALLS CHURCH
FA 6660

HERNDON
Herndon 1

FAIRFAX
FA 760

You Will Receive Courteous, Prompt Service
Regardless of the Amount You Purchase

ESTIMATES FREELY GIVEN

## CECO

STEEL PRODUCTS CORPORATION

★ ☆ ★

- Meyer Steel Forms
- Steel Roof Decks
- Metal Windows and Doors
- Steel Floor Joists

★ ☆ ★

In Construction Products
CECO ENGINEERING Makes the Big Difference

SALES OFFICE:
2011 K Street, N.W.
Washington 6, D.C.
Telephone: NA. 5814

## COMBUSTIONEER CORPORATION

HEATING AND AIR-CONDITIONING ENGINEERS

F. A. HESSICK, Pres. D. E. SHYTLE, Vice-Pres.

Combustioneer Automatic Coal Stokers
Westinghouse Air Conditioning Systems

401-09 TENTH STREET, S.W.
Washington, D. C.

Telephone: NAtional 5420

## Central Armature Works, Inc.

*Established 1915*

POWER AND LIGHT WIRING CONSTRUCTION

Complete Electrical Repair Service

**EXPERT REWINDING**

NO JOB TOO LARGE OR TOO SMALL

**625-27-29 D Street, N.W.**
Washington, D. C.

Telephone NAtional 3660
Night: Telephone VIctor 7916

*(Continued from page 8)*

Try to do those things which will fit you to hold down that job.

Get ready to be a junior executive. Kienzle, in his book "Climbing the Executive Ladder" says, ". . . . adjusting to the executive environment is one of the hardest problems the new executive has to face. There is a vast difference between executive and routine work, but amazingly enough, most persons are promoted to executive positions without any previous preparation . . . This is the reason so many people fail as executives; the reason most of us who make the grade do so by narrow margins . . ." Don't let opportunity knock and find you unprepared for the habit of deciding.

Develop the ability to lead. "Management Record" says in the November, 1948, issue that this is the most important characteristic, and that *no one is a born leader.* It is a developed ability. Develop it early.

Your approach to difficult problems may result in someone above you in the hierarchy bringing the "ladder up" to you. Welcome difficulty. Greet it as a challenge, and let it be known that you are complimented by having a tough one laid in your lap. People like to get others to do the difficult jobs, and the word gets around.

All of the foregoing should have placed your feet on the bottom rung of the ladder for which you have been looking. You will know when you have found it, for you will be occupying a junior executive position, probably the one for which you have prepared yourself.

Now that you are on the ladder, what next? The next trick is to stay on it, and to climb. There is nothing shaky about the ladder itself, but there may be something shaky in your grip on it. There is no rule which says that no-one can pass you. Climb you must, or you will surely be passed.

Much has been written about how to be a good executive. Two books might be mentioned as worth reading at length. They are "Design for a Career," a collection of letters from Erwin H. Schell to M.I.T. men, privately printed; and "The Technique of Executive Leadership" by James F. Bender. One statement made by Mr. Schell reads as follows: "Buoyancy of natural talent will work for you if you determine always to welcome difficulty, and you deservedly hold the good will of those about you."

From here on up, ability will be the deciding factor in how far you climb. Of course, you may "marry the boss' daughter" and get a vice presidency, but generally this does not happen, and usually does not work if it does happen. Politics in executive competition is a losing proposition.


MUTH

K&E Drafting Materials

Artists Supplies

710 13th Street, N.W.

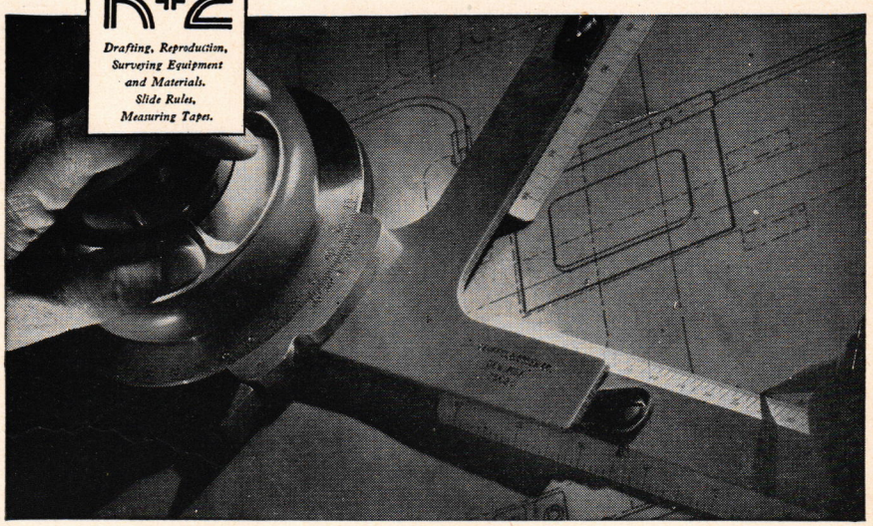
STerling 6323

partners in creating

K & E drafting instruments, equipment and materials have been partners of leading engineers for 81 years in shaping the modern world. So extensively are these products used by successful men, it is self-evident that K & E has played a part in the completion of nearly every American engineering project of any magnitude.

K+E

*Drafting, Reproduction, Surveying Equipment and Materials. Slide Rules, Measuring Tapes.*



KEUFFEL & ESSER CO.

EST. 1867

NEW YORK • HOBOKEN, N. J.

Chicago • St. Louis • Detroit

San Francisco • Los Angeles • Montreal

**WE SATISFY YOUR NEEDS**
***As A Student***
***As A Practicing Engineer***

A COMPLETE LINE OF
High Quality Slide Rules, Instruments, Technical Books, Tracing Papers & Cloth

COMPLETE REFRODUCTION SERVICE

**COOPER TRENT**

1130 19th St., N.W. ST. 7744
2629 Wilson Blvd. GL. 5800

**ALPHA INSTRUMENT CO.**

Expert repairs since 1918 to transits, drafting instruments, levels and related engineering instruments

REpublic 0570

2103 K Street, N.W. Washington, D. C.

High Fidelity Custom Radio-Phonograph
Tape Recorders from $124.95
Public Address Rentals

G. E., Webster, Bell, Meissner, Altec
and other high quality parts

DISCOUNTS TO STUDENTS

**Shrader Manufacturing Co., Inc.**
2803 M Street, N.W. ADams 0556

**Students Book Company**

— ☆ —

***A Complete Selection of TECHNICAL BOOKS***

— ☆ —

**2107 Pennsylvania Ave., N. W.**

**Washington Concrete Products Corp.**

***HIGH QUALITY CINDER BLOCKS SINCE 1926***

— ☆ —

**NA. 3087**

**1239 Jefferson Davis Highway**

**Arlington, Virginia**

*Meet Your Friends*
**at**
**Captain Tom's**
**BAR and GRILL**

***Michelob and Budweiser on Draught***

LIQUORS, WINES, COCKTAILS and SANDWICHES OUR SPECIALTY

**1807 H STREET, N. W.**
**Washington, D. C.**
**Phone: ME 9012 or 8081**

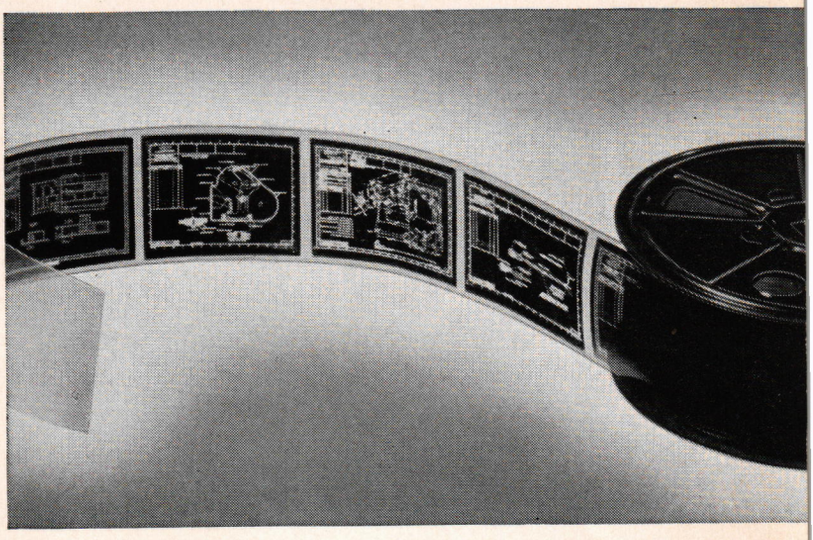
# Extreme accuracy makes photography a matchless engineering tool

**DRAWINGS ARE COPIED FAITHFULLY.** Photocopying reproduces engineering drawings, data, specifications, with high speed, utmost accuracy and in any quantity. Bright copies can be made from dimmed material. Originals are saved from wear and tear.

Accuracy is but one of the unusual abilities of photography which are important in engineering and other professions and businesses alike. Through its speed it can provide movies that slow down action which would be far too fast for eyes to follow. Through radiography it checks castings, welds, and assemblies without destroying the part.

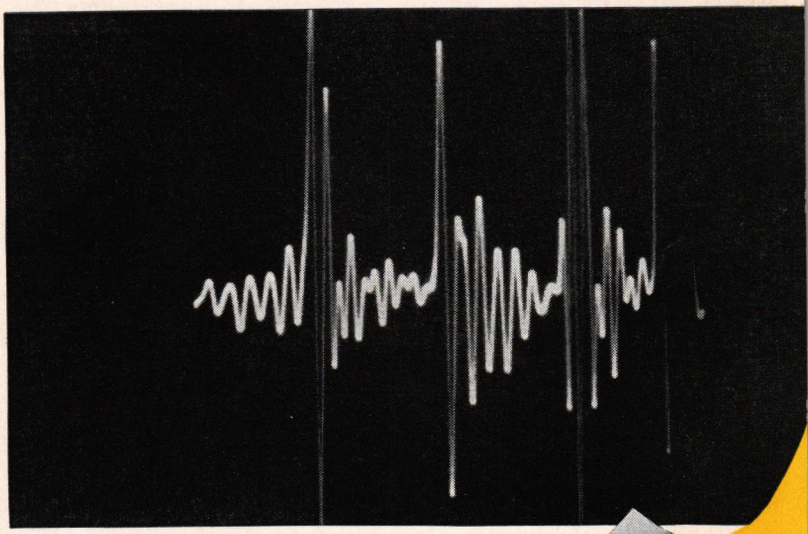
And so it goes all through the profession. You find photography saving time, improving products and procedures, simplifying processes.

**Eastman Kodak Company, Rochester 4, N. Y.**



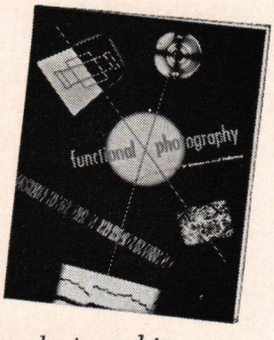
**IMPORTANT RECORDS PRESERVED.** With microfilming, engineering drawings and valuable records can be preserved with every detail intact. The film can be stored for easy reference in 98% less filing space than the originals would require.

**College graduates** in the physical sciences, engineering, and business administration regularly find employment with Kodak. Interested students should consult their placement office or write direct to Business and Technical Personnel Department, Eastman Kodak Company, 343 State Street, Rochester 4, N. Y.



**INSTRUMENT READINGS RECORDED.** Fleeting traces of the galvanometer mirror or cathode-tube beam can be recorded for study and analysis. Movement too fast for the eye is caught accurately by photography.

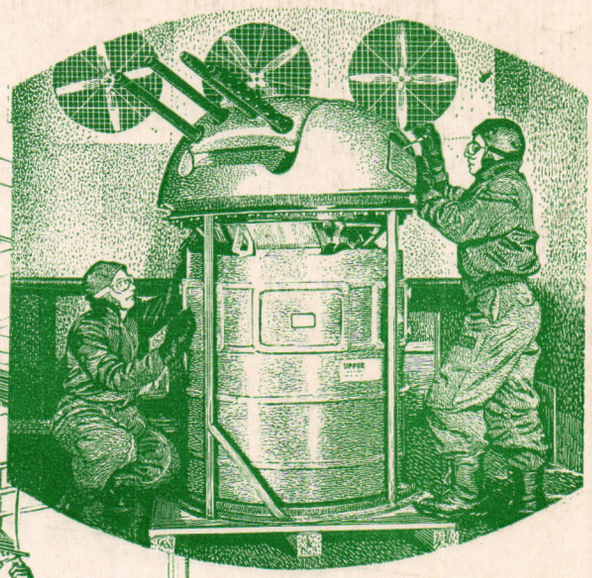
**Send for this FREE Book**



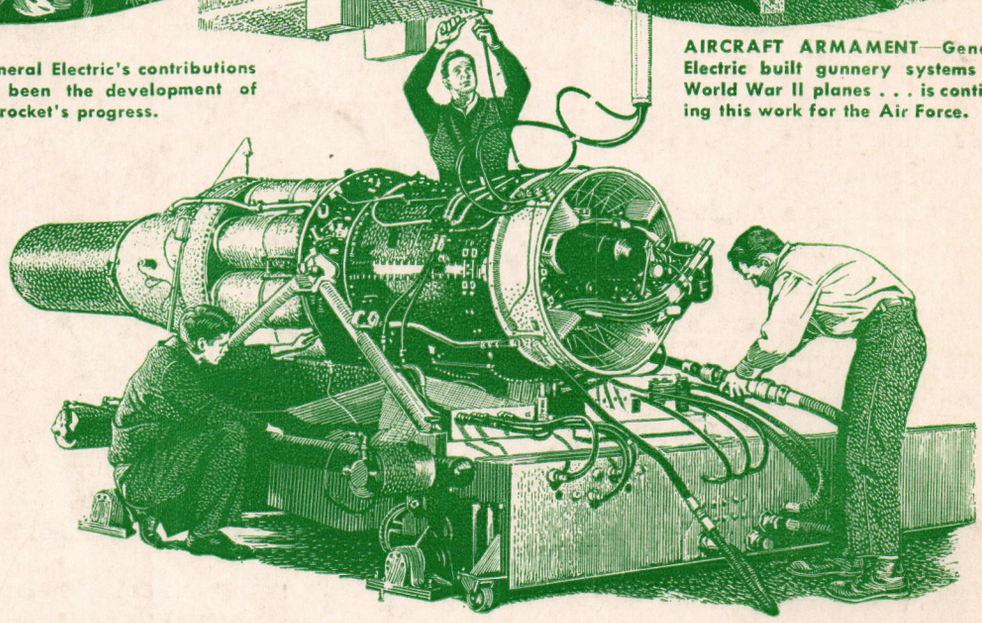

*It tells how photography is used to:*
Speed production · Cut engineering time
Assure quality maintenance · Train more workers faster · Bring new horizons to research

Kodak
TRADE-MARK

GUIDED MISSILES—Among General Electric's contributions to this military project have been the development of compact transmitters to report rocket's progress.



AIRCRAFT ARMAMENT—General Electric built gunnery systems for World War II planes . . . is continuing this work for the Air Force.



JET ENGINES—In 1941, the Air Force asked General Electric to build the first U.S. jet engine. Today, G-E engines power such fast planes as the F-86 Sabre, holder of world's speed record.

## College graduates at General Electric are working on some of the nation's most vital projects

The rocket that rises a hundred miles above White Sands, N. M., contains a wonderfully compact device that reads 28 instruments every one-thirty-fifth of a second and transmits its reports to receivers on the ground. It was developed by G-E engineers . . .

Development of special communications systems for civil defense has been undertaken by G-E electronics engineers . . .

The newest class of Navy heavy cruisers helping to guard our defense line gain their power from 30,000-horsepower propulsion turbines built by General Electric . . .

It is estimated that during 1951 more than 30 per cent of General Electric's production will comprise projects like these . . . the design and construction of equipment to help fill America's military needs.

The hundreds of General Electric engineers, physicists, chemists, and other specialists sharing in these projects work with the assurance that their contributions are meaningful and important. Their talents and skills, further developed through G-E training courses and broadened through rotational job programs, are standing the nation in good stead.

*You can put your confidence in—*

**GENERAL ELECTRIC**

DEAN F. M. FEIKER
SCHOOL OF ENGINEERING
GEO. WASH. UNIV.
WASH., D. C.